Rhenium is discovered quite late

The far more uncommon heavy metal rhenium, less of which is found in the earth's crust than even gold, occurs in low concentrations as a secondary component of molybdenum glance when associated with copper pyrites. As it is only exists in low concentrations and actual rhenium minerals are not known, the metal was discovered quite late - in 1925 by the German chemists Walther Noddack and Ida Tacke. Other minerals containing rhenium are columbite (ferromanganese niobate), tantalite (ferromanganese tantalate), gadolinite (yttrium berylijum silicate) and alvite (zirconium silicate).

Using a tedious enrichment process, Noddack and Tacke were ultimately able to trace the element rhenium in the mineral columbite and tantalite with the help of Roentgen spectra. In 1928 the researchers isolated one gram of pure rhenium for the first time ever from 660 kilograms (!) of molybdenum glance obtained from Norway.

In its pure form rhenium is platinum-like, shiny and very hard, and can only be shaped when heated to red heat. Its density (21.04), melting point (3,1860 C) and boiling point (literature data range from 5,6300 to 5,9000°C) are similar to those of tungsten. This is also true for the hardness of the metal, which can reach a value of 8.0 on the Mohs' scale for hydrogen-reduced, sintered and densified metal powder.
Natural rhenium consists of the isotopes Re-185 (37.4 percent) and Re-187 (62.6 percent). Rhenium-187 is a very weak beta-emitter, which with a half-life of 43 billion years disintegrates to osmium-187. The ratio of rhenium to osmium can thus be used in the geochronology to determine the age of the deposit.

Rhenium metal is usually highly resistant

In chemical terms, metallic rhenium is usually very resistant. When heated in air, it oxidizes to rhenium heptoxide in a quite violent and quantitative reaction already at temperatures between 400-600°C. It resists hydrochloric and hydrofluoric acids, but rhenium metal can be converted to perrhenic acid with nitric acid. The same product is produced - although very slowly - when extremely finely dispersed, moist rhenium is exposed to air oxidation at room temperature.

The highly specialized rhenium product program should also be mentioned here. H.C. Starck's product line ranges from ammonium perrhenate, potassium perrhenate and perrhenic acid to high-purity rhenium metal powder and rhenium pellets. The enormous success of this metal is coupled with a number of technical developments, including the installation of multiple tube and rotary tubular kilns for improved reduction. The breakthrough into the high-tech era came with the addition of a fully new solvent extraction process in 1987.

The main market for rhenium is still the catalyst sector. Here the metal is used among other things for the production of so-called bimetal reforming catalysts, which are used in the manufacture of high-octane and lead-free premium gasoline. ,,Rheniforming" is the name of the process developed by Chevron that works with a catalyst containing the metals platinum and rhenium on a carrier made from aluminum oxide.

The field of X-ray technology is another highly specialized application. Rhenium is used here as an alloying component of tungsten in rotating X-ray targets. As a component of superalloys, rhenium metal is also found in applications where particularly high stress resistance is required.

Aircraft turbines are an excellent and important example of components that are exposed to this kind of extreme stress.